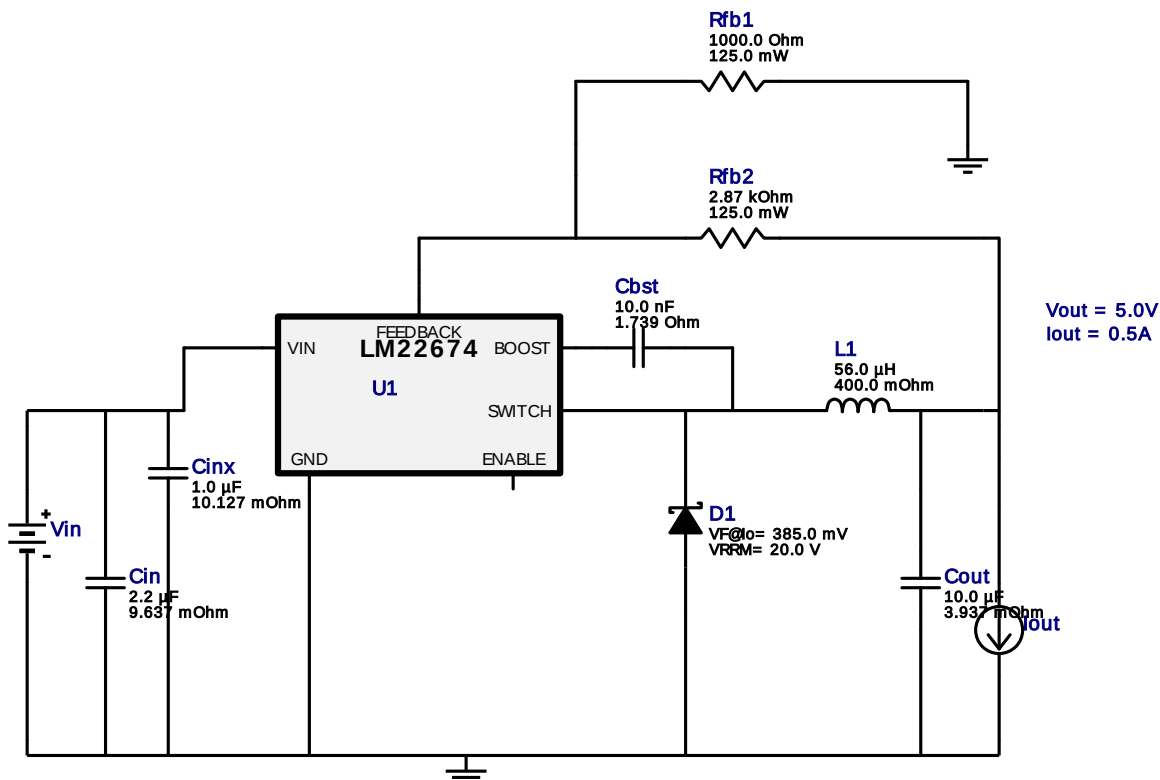


## WEBENCH® Design Report

Design : 4742013/251 LM22674MRE-ADJ/NOPB  
LM22674MRE-ADJ/NOPB 10.0V-12.0V to 5.00V @ 0.5A

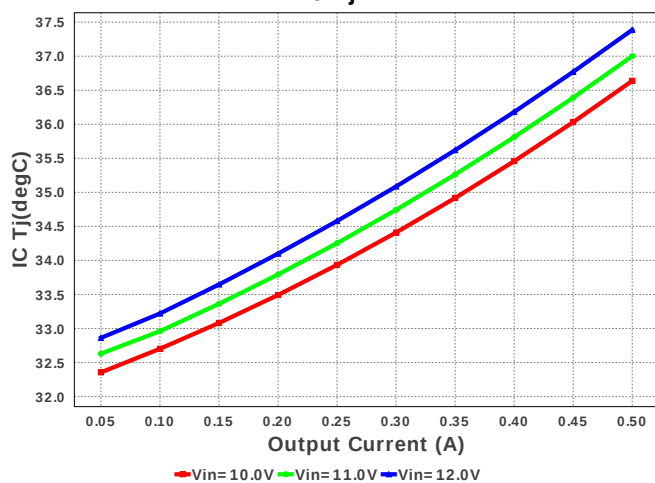


## Electrical BOM

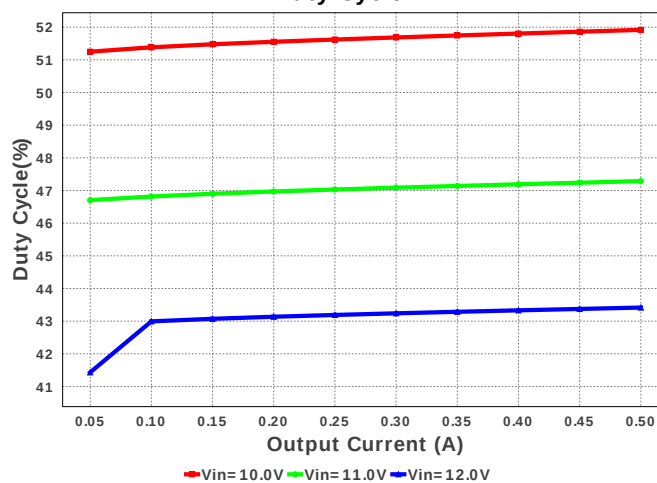
| #  | Name | Manufacturer     | Part Number                       | Properties                                                        | Qty | Price  | Footprint                     |
|----|------|------------------|-----------------------------------|-------------------------------------------------------------------|-----|--------|-------------------------------|
| 1. | Cbst | Kemet            | C0805C103K5RACTU<br>Series= X7R   | Cap= 10.0 nF<br>ESR= 1.739 Ohm<br>VDC= 50.0 V<br>IRMS= 411.0 mA   | 1   | \$0.01 | 0805 7 mm <sup>2</sup>        |
| 2. | Cin  | MuRata           | GRM188R61C225KE15D<br>Series= X5R | Cap= 2.2 uF<br>ESR= 9.637 mOhm<br>VDC= 16.0 V<br>IRMS= 1.20373 A  | 1   | \$0.02 | 0603 5 mm <sup>2</sup>        |
| 3. | Cinx | MuRata           | GRM188R61C105KA93D<br>Series= X5R | Cap= 1.0 uF<br>ESR= 10.127 mOhm<br>VDC= 16.0 V<br>IRMS= 994.63 mA | 1   | \$0.01 | 0603 5 mm <sup>2</sup>        |
| 4. | Cout | MuRata           | GRM219R61A106KE44D<br>Series= X5R | Cap= 10.0 uF<br>ESR= 3.937 mOhm<br>VDC= 10.0 V<br>IRMS= 2.7713 A  | 1   | \$0.03 | 0805 7 mm <sup>2</sup>        |
| 5. | D1   | ON Semiconductor | MBR0520LT1G                       | VF@Io= 385.0 mV<br>VRRM= 20.0 V                                   | 1   | \$0.06 | SOD-123 13 mm <sup>2</sup>    |
| 6. | L1   | NIC Components   | NPI54C560KTRF                     | L= 56.0 uH<br>DCR= 400.0 mOhm                                     | 1   | \$0.09 | IND_NPI54C 61 mm <sup>2</sup> |
| 7. | Rfb1 | Panasonic        | ERJ-6ENF1001V<br>Series= ERJ-6E   | Res= 1000.0 Ohm<br>Power= 125.0 mW<br>Tolerance= 1.0%             | 1   | \$0.01 | 0805 7 mm <sup>2</sup>        |

| #  | Name | Manufacturer      | Part Number                     | Properties                                           | Qty | Price  | Footprint                                                                                                     |
|----|------|-------------------|---------------------------------|------------------------------------------------------|-----|--------|---------------------------------------------------------------------------------------------------------------|
| 8. | Rfb2 | Panasonic         | ERJ-6ENF2871V<br>Series= ERJ-6E | Res= 2.87 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 9. | U1   | Texas Instruments | LM22674MRE-ADJ/NOPB             | Switcher                                             | 1   | \$1.44 |  MRA08B 56 mm <sup>2</sup> |

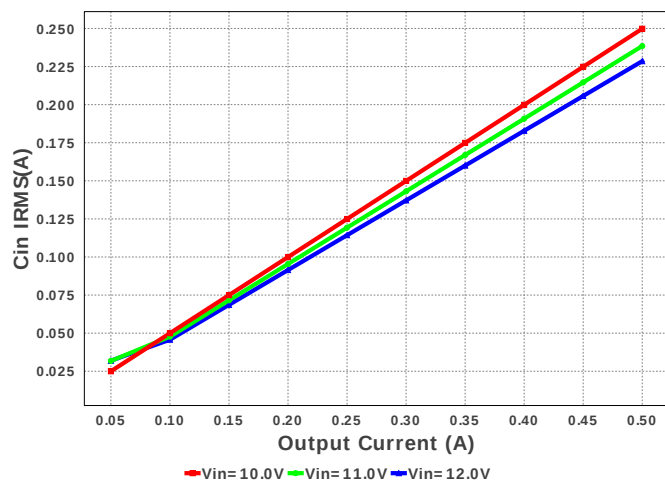
IC Tj



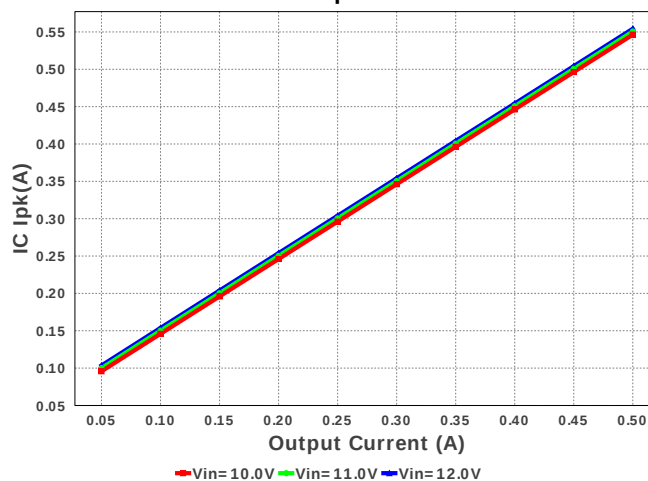
Duty Cycle

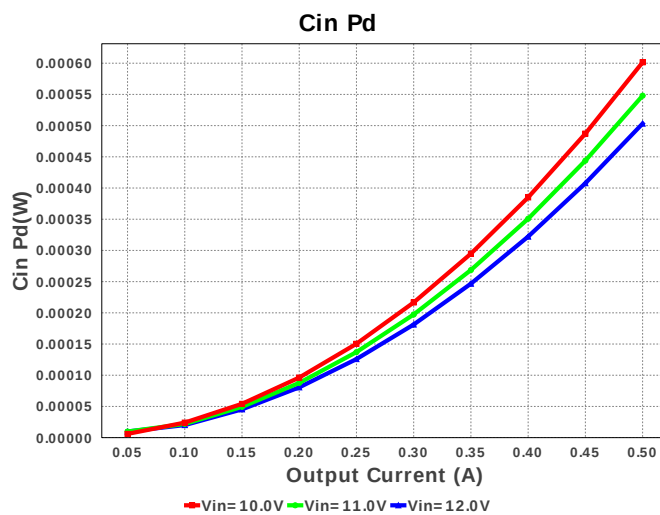
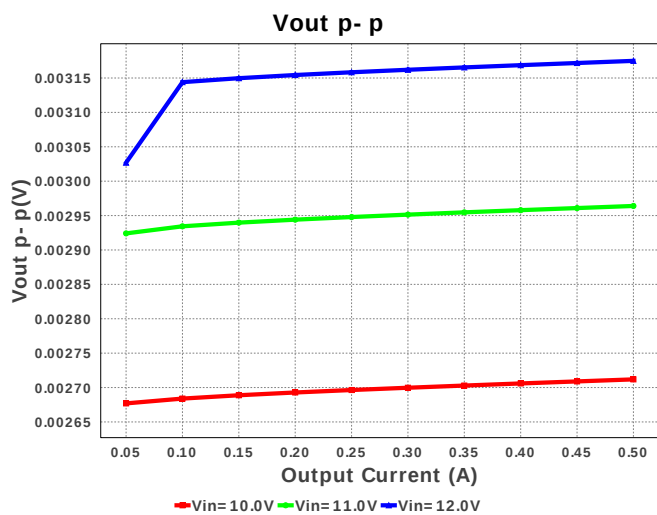
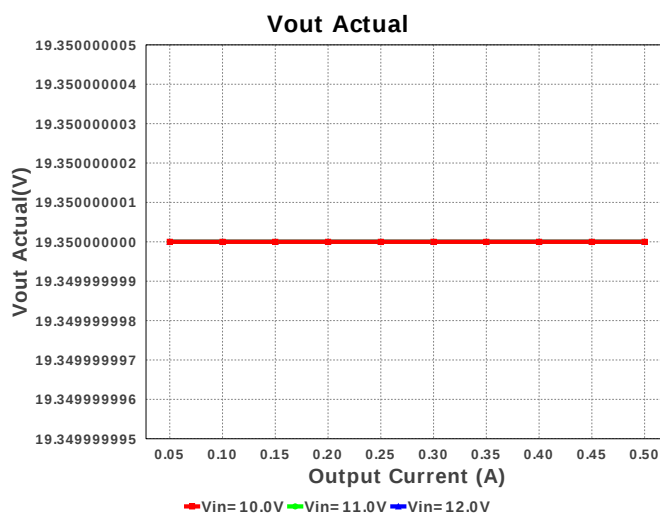
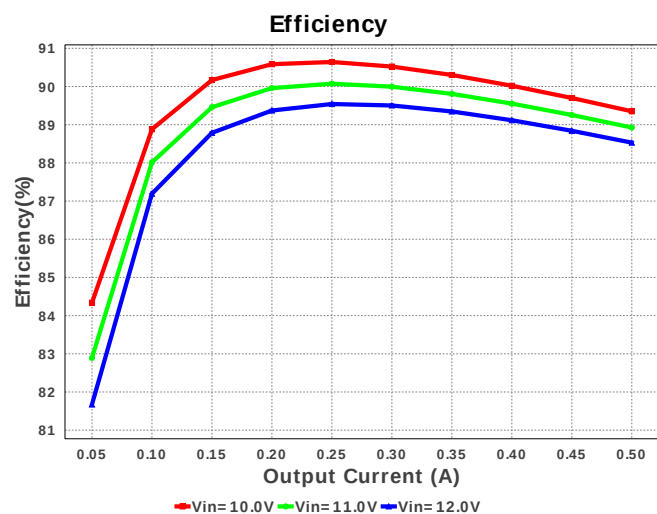
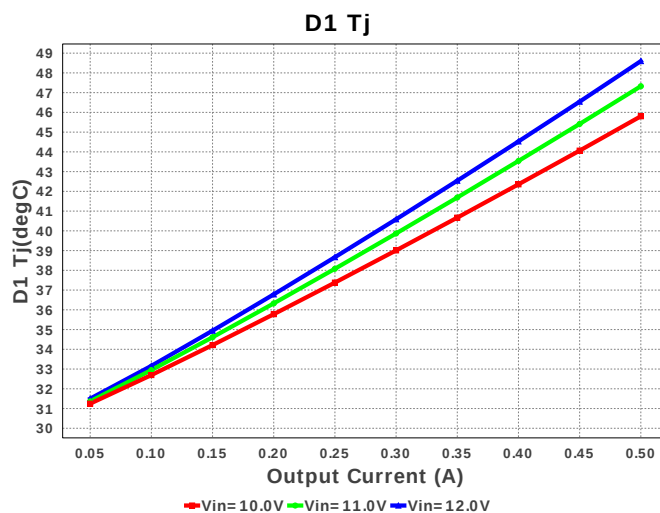
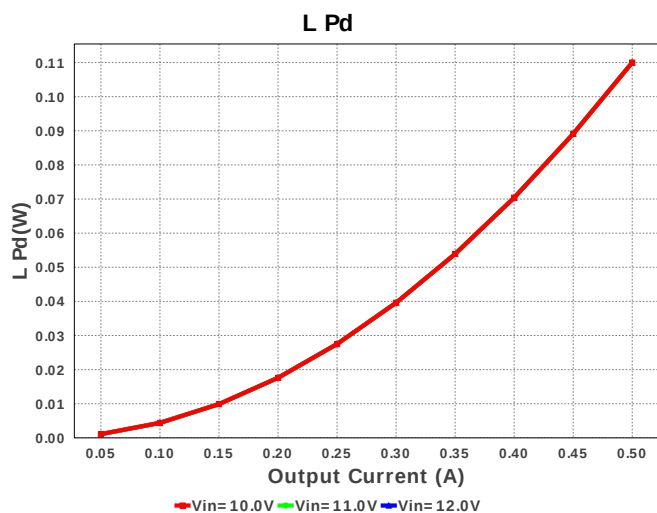


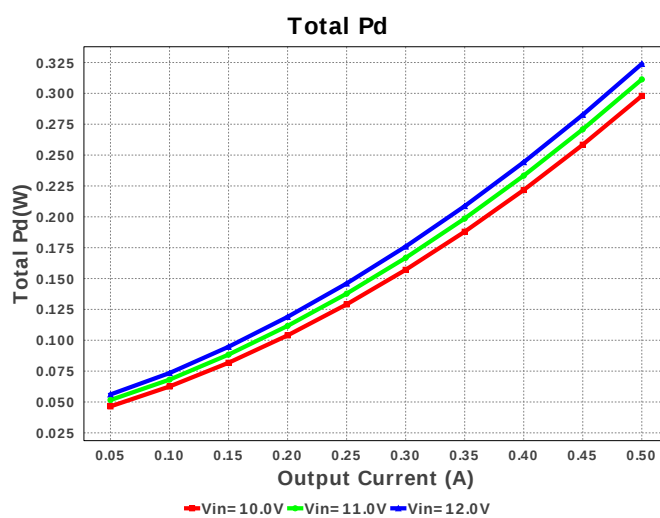
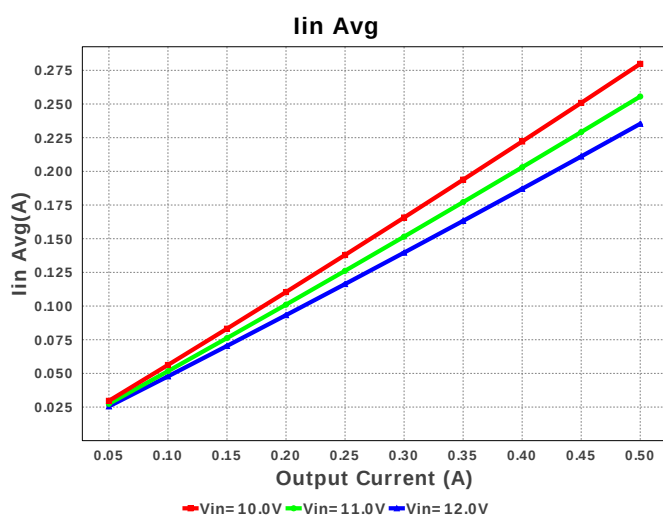
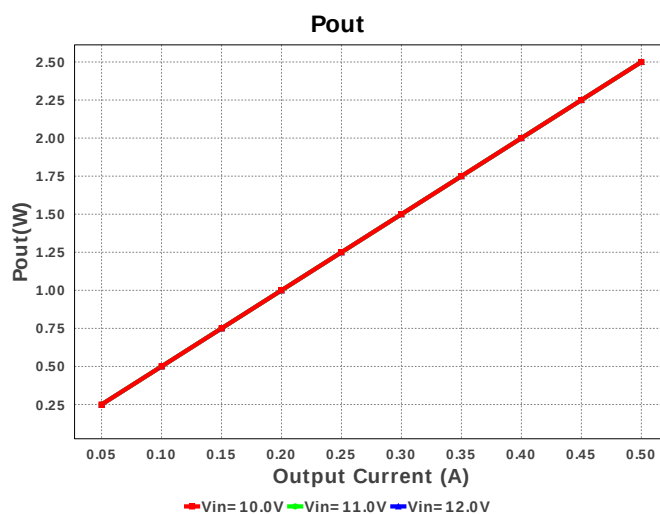
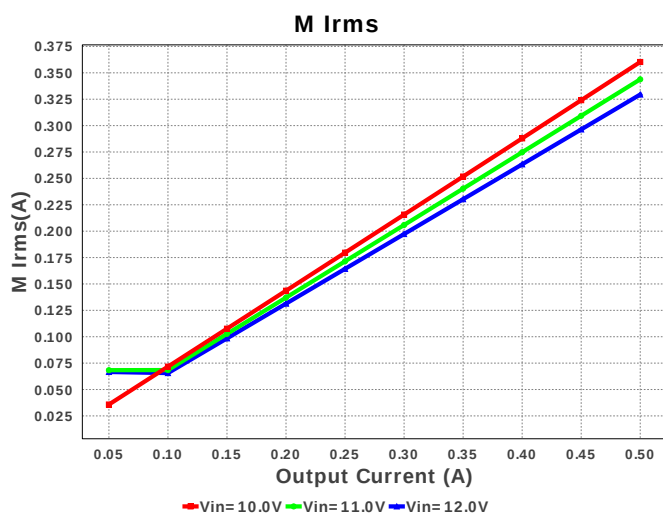
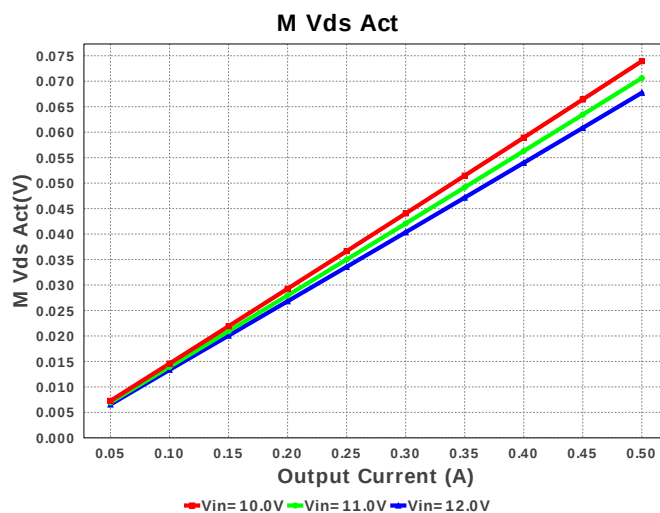
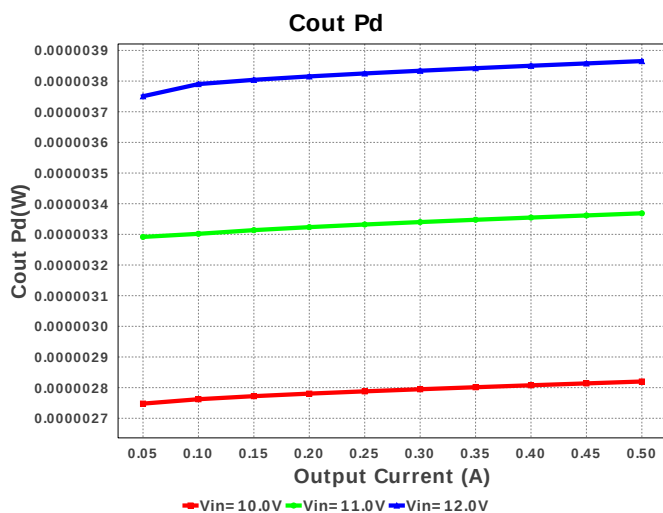
Cin IRMS

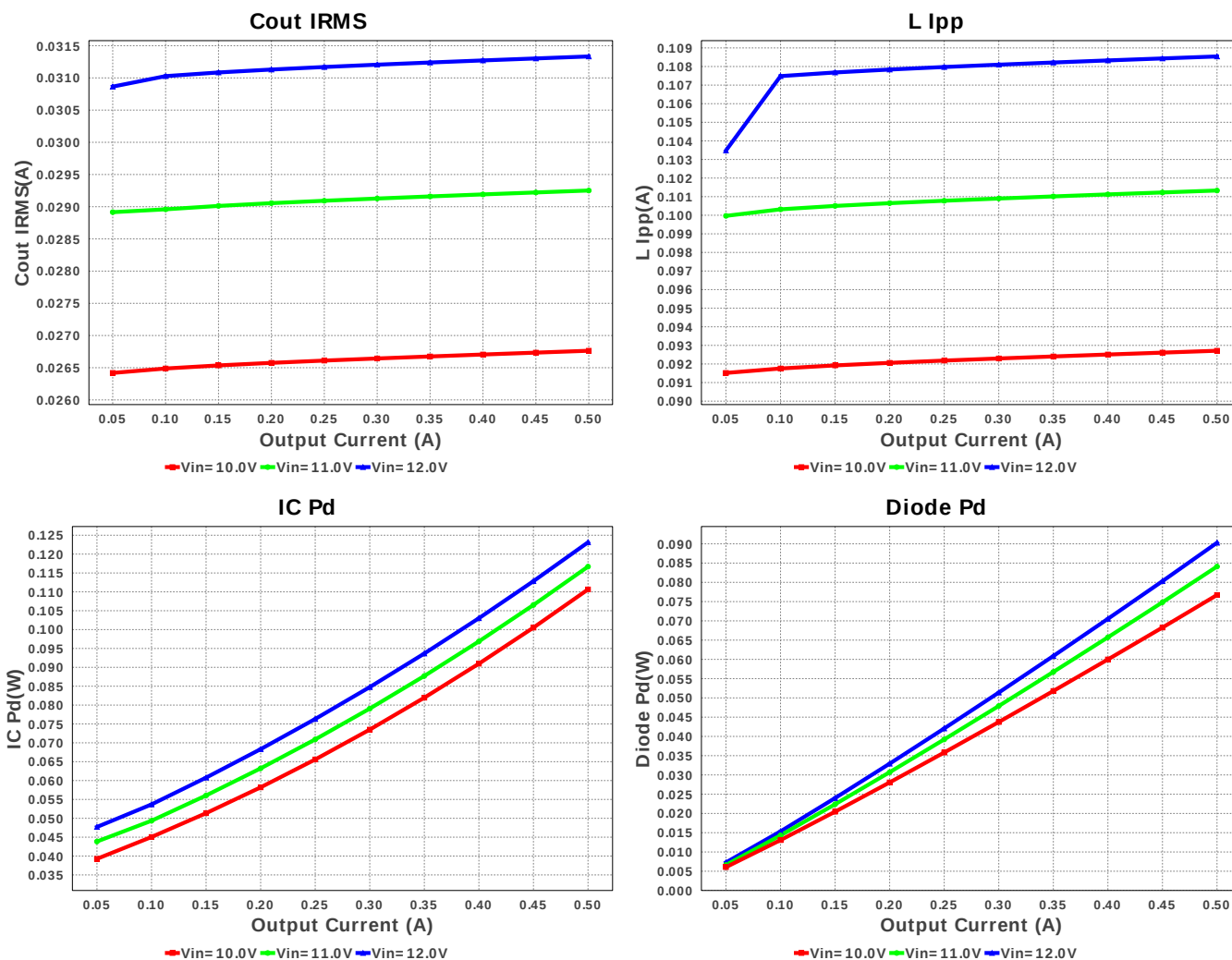


IC Ipk









## Operating Values

| #   | Name         | Value                 | Category | Description                                                        |
|-----|--------------|-----------------------|----------|--------------------------------------------------------------------|
| 1.  | Cin IRMS     | 228.523 mA            | Current  | Input capacitor RMS ripple current                                 |
| 2.  | Cout IRMS    | 31.333 mA             | Current  | Output capacitor RMS ripple current                                |
| 3.  | IC Ipk       | 554.27 mA             | Current  | Peak switch current in IC                                          |
| 4.  | Iin Avg      | 235.32 mA             | Current  | Average input current                                              |
| 5.  | L Ipp        | 108.54 mA             | Current  | Peak-to-peak inductor ripple current                               |
| 6.  | M1 Irms      | 329.455 mA            | Current  | Q lavg                                                             |
| 7.  | BOM Count    | 9                     | General  | Total Design BOM count                                             |
| 8.  | FootPrint    | 166.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components                            |
| 9.  | Frequency    | 500.0 kHz             | General  | Switching frequency                                                |
| 10. | IC Tolerance | 19.0 mV               | General  | IC Feedback Tolerance                                              |
| 11. | M Vds Act    | 67.727 mV             | General  | Voltage drop across the MosFET                                     |
| 12. | Pout         | 2.5 W                 | General  | Total output power                                                 |
| 13. | Total BOM    | \$1.68                | General  | Total BOM Cost                                                     |
| 14. | D1 Tj        | 48.597 degC           | Op_Point | D1 junction temperature                                            |
| 15. | Vout Actual  | 4.973 V               | Op_Point | Vout Actual calculated based on selected voltage divider resistors |
| 16. | Vout OP      | 5.0 V                 | Op_Point | Operational Output Voltage                                         |
| 17. | Cross Freq   | 43.911 kHz            | Op_point | Bode plot crossover frequency                                      |
| 18. | Duty Cycle   | 43.416 %              | Op_point | Duty cycle                                                         |
| 19. | Efficiency   | 88.53 %               | Op_point | Steady state efficiency                                            |
| 20. | IC Tj        | 37.387 degC           | Op_point | IC junction temperature                                            |
| 21. | ICThetaJA    | 60.0 degC/W           | Op_point | IC junction-to-ambient thermal resistance                          |
| 22. | IOUT_OP      | 500.0 mA              | Op_point | Iout operating point                                               |
| 23. | Phase Marg   | 47.945 deg            | Op_point | Bode Plot Phase Margin                                             |
| 24. | VIN_OP       | 12.0 V                | Op_point | Vin operating point                                                |
| 25. | Vout p-p     | 3.175 mV              | Op_point | Peak-to-peak output ripple voltage                                 |
| 26. | Cin Pd       | 503.269 μW            | Power    | Input capacitor power dissipation                                  |
| 27. | Cout Pd      | 3.865 μW              | Power    | Output capacitor power dissipation                                 |
| 28. | Diode Pd     | 90.279 mW             | Power    | Diode power dissipation                                            |
| 29. | IC Pd        | 123.113 mW            | Power    | IC power dissipation                                               |
| 30. | L Pd         | 110.0 mW              | Power    | Inductor power dissipation                                         |
| 31. | Total Pd     | 323.894 mW            | Power    | Total Power Dissipation                                            |

| #   | Name           | Value   | Category | Description                                                                                |
|-----|----------------|---------|----------|--------------------------------------------------------------------------------------------|
| 32. | Vout Tolerance | 2.999 % |          | Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable |

## Design Inputs

| #  | Name    | Value   | Description            |
|----|---------|---------|------------------------|
| 1. | Iout    | 500.0 m | Maximum Output Current |
| 2. | VinMax  | 12.0    | Maximum input voltage  |
| 3. | VinMin  | 10.0    | Minimum input voltage  |
| 4. | Vout    | 5.0     | Output Voltage         |
| 5. | base_pn | LM22674 | Base Product Number    |
| 6. | source  | DC      | Input Source Type      |
| 7. | Ta      | 30.0    | Ambient temperature    |

## Design Assistance

1. Part Description The LM22674 is a monolithic integrated circuit that provides all of the active functions for a step-down (buck) switching regulator capable of driving up to 0.5A loads with excellent line and load regulation characteristics. High efficiency (>90%) is obtained through the use of a low ON-resistance N-channel MOSFET.

2. **LM22674** Product Folder : <http://www.ti.com/product/LM22674> : contains the data sheet and other resources.

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